

casting of a disguising film will not account for the second operation.

In *Pyromelana* the change of plumage is very slow; the feathers daily gain in intensity, the pale buff of the underparts getting scarcely perceptibly deeper, until at length the velvet-black and fiery orange in *P. franciscana* appear as mere spots or shaft-streaks, which gradually expand fanwise towards the outer fringes of the feathers. This spotting, however, is very uneven, some feathers being developed in advance of others, so as to give the bird a very patchy appearance. In the bright yellow and black plumage of *P. afra* this is even more noticeable.

At the change of plumage the flank-feathers and upper tail-coverts are moulted out, being replaced by long soft feathers, which droop over and almost hide the tail: but none of the feathers of the head, back, breast, and belly are lost; they simply undergo a gradual change of colour.

If it is possible, and we know that it is, for the plumage of birds to be seriously affected after death, there is no reason for asserting that a perfect feather possesses no vitality, and is therefore incapable of change of colour.

Perhaps one of the most marked alterations in coloration after death which I have noticed is that which takes place on the breast of the male Gouldian Finch (*Poephila mirabilis*). In life the breast is vivid ultramarine-blue or very bright pansy-blue; after death the blue gradually fades out of the feathers, leaving them of a dull lilac.

XXVIII.—*On the Nesting of Cassicus persicus, Cassidix oryzivora, Gymnomystax melanicterus, and Todirostrum maculatum.* By Dr. EMIL A. GOELDI, C.M.Z.S., Director of the Museum in Pará.*

I. CASSICUS PERSICUS and CASSIDIX ORYZIVORA.

The nests of most Brazilian birds are by no means easily

* [For a previous article on a similar subject by Dr. Goeldi, see 'Ibis,' 1896, p. 299, and observe that the editorial footnote at the commencement of that article is intended to refer to Koenig-Warthausen in J. f. O. 1868, and not to Dr. Goeldi's excellent notes.—EDD.]

to be found, and travellers who do not devote much time to the subject will generally see very little of the birds' breeding-habits. There are, however, exceptions, and one of these is offered by *Cassicus persicus*. This is by far the most predominant Cassique in Lower Amazonia and Guiana, and colonies of it, consisting of a more or less considerable number of pendent nests dangling on the branch-ends of the trees, are to be seen everywhere, and are sure to strike even the most casual tourist's attention on board the Amazonian steamers. Here, in Pará, *Cassicus persicus* is a daily visitor in every large orchard, and though the suburb of Nazareth is to-day much more densely inhabited than it was when Mr. Wallace wrote his most interesting book, I know of a colony of "Japiims" with a dozen nests on a high tree near the course of two of the most frequented roads of this suburb, and only some 60 steps distant from our museum.

The bag-nests of *Cassicus persicus* are, in comparison with those of *Ostinops decumanus*, shorter and more cylindrical. Two specimens brought by me from Amapá in 1895 are only from 40 to 42 cm. long and 12 cm. wide in the upper part, and 15 cm. in width in the lower part. The entrance-hole is stirrup-shaped and situated on the upper portion. It measures 15 cm. in length and about 10 cm. in breadth.

The material of these bag-nests consists exclusively of dry fibres of the assaý-palm-tree-leaves (*Euterpe oleracea*), which are woven by the bird into a fabric of very great strength, so that it is almost impossible to tear it. The fact that in Amazonia the material usually employed consists of assaý-leaves is very well known to everybody in the country. This fact becomes specially interesting to naturalists who remember that the range of *Cassicus persicus* reaches southward to Bahia, *i. e.* into a region where the assaý-palm does not grow. We know, from the description given by Prince Maximilian zu Wied-Neuwied (Beitr. iii. p. 1239), that the material employed by this bird in the coast-zone of Bahia consists of threads of *Tillandsia* ("Barba de velho") and of similar *Bromelia*-fibres. This statement agrees entirely with my observations in Southern Brazil as regards

Ostinops decumanus and *Cassicus hæmorrhous*. *Tillandsia*-threads are softer and of a greyish colour, while fibres of assaý-leaves are more rigid and of a straw-colour—so that *Cassicus*-nests of unknown origin may be at any time certainly recognized by their materials as to whether they come from the southern or from the northern parts of Brazil. The life and growth of these *Tillandsia*-fibres are not always interrupted by their employment in the nests. I have often observed instances of these Bromelias growing under such circumstances.

The eggs of *Cassicus persicus* were not obtained by Prince zu Wied. Whether they have been more recently procured I am not able to say from the literature at my disposal. They are of a very pale yellow-reddish colour, almost regularly covered with pale neutral-tint signs and points in two layers of different intensity. The measurements of two Guianan eggs are :—(1) Long. axis 25·5 mm., transv. axis 19 mm.; (2) long. axis 27·5 mm., transv. axis 18 mm.

In a letter dated Sept. 12th, 1896, Mr. Sclater writes to me :—“ We have been recently informed that *Cassidix oryzivora* is parasitic on *Cassicus persicus*—like *Molothrus*. Do you know anything about this matter? ” Now I really know something about this question, and have even published some remarks concerning it some years ago*.

In Southern Brazil it is well known that *Molothrus bonariensis* lays its eggs in the nests of other birds, especially in that of *Zonotrichia pileata*. Its larger relative (*Cassidix oryzivora*) lays its eggs in the nests of birds of similar proportions to itself, especially in those of *Ostinops decumanus*, and probably also in those of *Cassicus hæmorrhous*. As regards *Ostinops*, there is absolutely no doubt; I have

* In my little book ‘Aves do Brazil’ (Rio de Janeiro), written in 1892 and printed in 1894—a book which has been condemned by ‘Natural Science’ as “being of no value as a contribution to science.” If, however, the editors of that periodical would give themselves the trouble to study it a little more from the biological standpoint, and not merely through anatomical and systematical spectacles, they would, perhaps, be able to record a somewhat more favourable opinion of it.—E. A. G.

verified it myself, and in my collection of birds of the Serra-des-Orgãos Mountains, Rio de Janeiro, are specimens of the eggs of *Cassidix* taken with my own hands out of nests of the *Ostinops*. I have seen the eggs of both together in one nest, and have several times reared young ones of the *Cassidix* along with their yellow-tailed brethren. The little *Molothrus* has, besides some others, the popular name "Parasita"; *Cassidix oryzivora* is called "Melro" in Rio de Janeiro, in Northern Brazil "Graúna" (an abbreviation of the Tupí words "guíra-úna" = black-bird)*.

When I arrived in Pará, I was surprised at being told by several persons that the "Graúna" has the habit of laying its eggs in the nest of the "Japiim" (= *Cassicus persicus*). I had thus an interesting confirmation of my own observations in Rio de Janeiro, and have come to the conclusion that *Cassidix oryzivora* is parasitic everywhere, choosing in North and South Brazil for its eggs the nests of the respective *Cassidine* species, the size of which agrees best with its own. There is thus in *Cassidix oryzivora* a remarkable example of the adaptation of a bird with cuckoo-habits to different local faunistic relations, and a nice parallel to the phenomenon offered by *Cassicus persicus*, which changes its nesting-material in accordance with the change of plants in different latitudes †.

I may add that *Cassicus persicus* had eggs when we were in Connaný, between October 11th and 26th, 1895, and that

* As regards popular names much care is always necessary. The same name—"Graúna," for example—is used in Southern Brazil for *Aphobus chopi* and on the island of Marajó for *Amblycercus solitarius*.—E. A. G.

† Just as the material used by *Cassicus persicus* for its nest in Bahia (and southwards) is different from that used by the same bird in Pará, the material employed by *Ostinops decumanus* in these two countries respectively is also different. I have stated that in Southern Brazil *Ostinops* uses exclusively the "Barba de velho" (*Tillandsia usneoides*), and that these southern nests are of a greyish colour. On the Amazon the material employed by this bird is composed of—(1) a black hairy substance, very like horsehair or delicate and elongated roots [which botanical researches in the Pará Museum prove to be a most interesting lichen, but of which it is not yet possible to ascertain the exact

we met with young birds in the nests during our residence in Amapá from the 26th October to 11th November. The breeding-period in Southern Guiana agrees with that in Pará. We know from the Prince zu Wied (*op. cit.* p. 1240) that he generally observed the young birds in the nests found by him on the Rio Belmonte, Bahia, towards the end of December. A slightly earlier breeding-time in the northern regions compared with the southern Brazilian States seems to me to be a generally prevailing phenomenon, of which I have a number of instances.

2. GYMNOMYSTAX MELANICTERUS.

The splendid yellow-and-black-coloured, Oriole-like Icterid, *Gymnomystax melanicterus*, called "Aritaná" here in Lower Amazonia, is a real ornament of the campos-region of Marajó and Southern Guiana wherever these districts are traversed by rivers. Damp meadows and muddy shores, alternately covered and uncovered by the tides, are the favourite resorts of this interesting bird of charming appearance. It is of confident demeanour and fond of human residences, breeding regularly in the immediate vicinity of the fazendas. In its character it reminds me much more of the "Vira-bostas" (*Molothrus*) than of the genuine Trupiais and Cassiques; it frequents cattle-settlements, is often engaged on the ground with cattle-dung, and walks about there for quarters of an hour together in the manner of the European Starling. I have been recently told that its range increases with the extension of cattle-breeding, and that it makes its appearance along with cattle in regions where it has not been seen before, *e. g.* in the Município de Mazagão, in the north channel of the Amazonian estuary. When flying it calls *wrég-krég*; when

systematic name]; (2) of the dry and tender roots of certain orchids of a yellowish colour.

As the proportion of both substances is almost as two to one, and the black root-like lichen is largely predominant, the general aspect of these northern nest-bags is of a *blackish* colour, contrasting in a striking manner with the grayish *Tillandsia*-structures of Southern Brazil.

in good humour and perched near its nest it emits a song like *tíng-tíng-wrég-wrég-gri-gri*, and is, in a few words, a bird not easily to be overlooked by a visitor to a Marajó cattle-settlement, making itself known as well by its appearance as by its voice.

Mr. Selater writes in vol. xi. of the 'Catalogue of Birds in the British Museum' (p. 361):—"This remarkable form has been often placed with the *Agelæinæ*. But the slightly

Fig. 1.



Nest of *Gymnomystax melanicterus*.

decurved culmen and lineiform mesorhinium justify us, I think, in removing it to the *Icterinæ*, with which it agrees in style of plumage, as it does also, I believe, in habits and mode of nesting." As I could not find anything published about the mode of nesting of *Gymnomystax*, and as Mr. Selater has also kindly informed me of the absence of any authentic observations on the subject, I have made all possible efforts to clear up the missing link.

Frankly speaking, I had for a long time the same opinion as to the correct position of *Gymnomystax* as is indicated above. But I became somewhat doubtful when I noticed the Starling- or *Molothrus*-like mode of life, and the results of my observations of the last two years as to the breeding of this bird indicate an aberrant and rather isolated position of *Gymnomystax* in the Icterine group.

I have two nests of the "Aritaná," both from the island of Marajó. The first is a present from a friend, and was taken in December 1895 on his extensive cattle-settlements; the second I took myself during a recent journey to the same locality, Cabo Magoarý, in August and September, 1896. The photograph of the first nest (fig. 1, p. 366) will give a good idea of it.

These nests are open and porringer-shaped, similar to those of certain Thrushes, and quite different from the bag-nests of *Ostinops* and *Cassicus*, so far as I know them, and from other constructions of the Icterinæ that we see figured in many ornithological works. The material consists of grass-leaves (whole and longitudinally split), slender roots, and fragments of small climbing plants*. There is no softer lining.

The second nest, taken by myself at Fazenda Livramento, was situated in the fork of a branch and well hidden in the foliage of the crown of a "moregeira-" tree (*Andira* sp. inc.), some 8 or 10 m. above the ground. The tree was distant not more than, perhaps, some 30 steps from the central buildings of the above-mentioned fazenda, in the open farm-yard, and in the midst of a considerable and constant crowd of men, horses, and cattle. Nevertheless the "Aritaná" is very circumspect in the vicinity of its breeding-tree, and, when it finds itself observed, does not readily approach. The discovery

* The slender roots with exquisite nodules, which can be perfectly perceived on the photograph, and play an important part in this nest, are those of an interesting aquatic plant, *Marsilia polycarpa*, Hooker et Grev., the nodules being the macro-sporangia. The climbing plant used in both nests is one of the Cucurbitacere. I am indebted for this information to my colleague, Dr. J. Huber, the Botanist of the Pará Museum.—E. A. G.

of this nest was only effected by patiently waiting for some hours in a hidden corner.

As regards the eggs of *Gymnomystax*, I have been somewhat unfortunate. The eggs which were sent to me together with the first nest arrived broken and do not allow of measurements. The fragments, however, show a bluish-white surface, with large, dark, irregular spots; they give me the idea of some resemblance to a smaller version of the egg figured as that of *Icterus cristatus* by Thienemann (Abbildungen von Vogeleiern, pl. xxxvii. fig. 7). The second nest contained on the day of my arrival at Livramento (August 28th) three naked young birds, which I did not interfere with. On my return to the locality a fortnight after, I found the nest empty and the birds gone.

+ 3. TODIROSTRUM MACULATUM.

It seems that since the time of Prince Maximilian zu Wied nobody has written about the breeding-habits of any member of the genus *Todirostrum*, which belongs to the smaller forms of the Tyrannine subfamily Platyrhynchinae. The Prince writes (Beitr. iii. p. 967) of the nest of *T. poliocephalum*:—"Ein solches Nest, welches wir in der Nähe des Flusses Parahyba in einem hohen *Gamelera*-Baume (*Ficus*) fanden,—man versicherte mich, es gehöre diesem Vogel an,—war von Baum- und Pflanzenwolle erbaut, von länglich-kugeliglicher Gestalt, oben über geschlossen, und vorn mit einer sehr kleinen Oeffnung zum Eingange des Vogels versehen; es wird in meinen Abbildungen zur Naturgeschichte Brasilien's mitgetheilt werden"*.

Todirostrum maculatum—a common bird, and a daily guest in the gardens of Pará—is well known by the people under the trivial name of "Ferreirinho" (little smith). There is almost no hour of the day when we do not hear the characteristic song of this little bird, which is ever busy among the shady foliage of the fruit-trees. Its song may be imitated by the syllables *tsi-tsiridi-tsiridi-tsi-tsi*, and may at the same time be compared to the sound produced by winding up a watch.

* It seems that this promise remained unaccomplished, as in my copy of the 'Abbildungen' there is no plate referring to the nest in question.—E. A. G.

Fig. 2.



Nest of *Todirostrum maculatum*.

In February, 1896, I discovered a nest in our museum garden, only some ten steps from the building. It was near the end of a short branch of an "abin"-tree (*Lucuma caimito*), at a height of about seven metres, rather well hidden, and more in the central than in the outer part of the crown of the tree. The nest, of which the photograph (fig. 2, p. 369) gives an adequate idea, is of bag-like construction, with a lateral entrance-hole. This hole, which is small and circular, is provided with a protecting roof. The material consists essentially of fibres of palm-tree leaves (cocoanut and "inaja") and particles of straw. Many of these fibres hang down in a negligent manner to an extent equal to the length of the nest, which, in comparison with the diminutive bird (certainly one of the smallest forms of the Tyrannidæ), must be called a very large one. The upper part, with the connection to the branch, is produced into a long conical horn.

Observing that the "Ferreirinho" was breeding, I resolved to take the nest and its contents on February 22. I obtained male, female, and eggs. These eggs, two in number, were still nearly fresh. They measured:—(1) 16 mm. long. axis, 11.5 mm. transv. axis; (2) 16.5 mm. long. axis, 11.5 mm. transv. axis. The point of section of the two axes for both eggs was 6 mm. distant from the blunt pole. The ground-colour is a pure white, but, having a large number of delicate and small rosy points, becomes of a pale rosy tinge. They are frail and minute objects, but well proportioned to the dimensions of the graceful little bird, a genuine Liliputian Tyrant, with a white iris.

I suppose it was the second laying, and that the former, corresponding to the months September to November, had probably escaped my attention.

In Pará I have never seen any other species of *Todirostrum* than *T. maculatum*; but on the island of Marajó I found another, easily distinguishable from being entirely yellow on the lower surface. I believe it to be *Todirostrum cinereum*, figured by Spix (Av. Brasil. pl. ix. fig. 2) under the name *Todus melanocephalus*.

October, 1896.